



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

10/550,678

04/12/2008

Dietrich Willem Van Der Plas

8674.031.US0000

8339

77213

7590

04/28/2009

Novak Druce + Quigg, LLP
1300 Eye Street, NW, Suite 1000
Suite 1000, West Tower
Washington, DC 20005

EXAMINER

WONG, EDNA

ART UNIT

PAPER NUMBER

1795

MAIL DATE

DELIVERY MODE

04/28/2009

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/550,678	VAN DER PLAS ET AL.	
	Examiner	Art Unit	
	EDNA WONG	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 24 February 2009.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-17 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-17 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

This is in response to the Amendment dated February 24, 2009. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office Action.

Response to Arguments

Specification

The disclosure has been objected to because of minor informalities.

The objection of the disclosure has been withdrawn in view of Applicants' amendment.

Claim Rejections - 35 USC § 112

I. Claims **1-14** have been rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The rejection of claims 1-14 under 35 U.S.C. 112, second paragraph, has been withdrawn in view of Applicants' amendment.

II. Claims **1-14** have been rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential steps, such omission amounting to a gap between the steps. See MPEP § 2172.01. The omitted steps are: the electrolysis of Al_2S_3 .

The rejection of claims 1-14 under 35 U.S.C. 112, second paragraph, has been withdrawn in view of Applicants' amendment.

Claim Rejections - 35 USC § 102/103

Claims **1-5, 7-9 and 14** have been rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over **Khazanov et al.** ("Electrolysis of Fused Aluminum Sulfide", *Legkie Metally* (1935), Vol. 4, No. 11, pp. 1-14).

The rejection of claims 1-5, 7-9 and 14 under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Khazanov et al. has been withdrawn in view of Applicants' amendment.

Claim Rejections - 35 USC § 103

I. Claim **6** has been rejected under 35 U.S.C. 103(a) as being unpatentable over **Khazanov et al.** ("Electrolysis of Fused Aluminum Sulfide", *Legkie Metally* (1935), Vol. 4, No. 11, pp. 1-14) as applied to claims 1-5, 7-9 and 14 above, and further in view of **Greenfield** (US Patent No. 2,939,824).

The rejection of claim 6 under 35 U.S.C. 103(a) as being unpatentable over Khazanov et al. as applied to claims 1-5, 7-9 and 14 above, and further in view of Greenfield has been withdrawn in view of Applicants' amendment.

II. Claim **10** has been rejected under 35 U.S.C. 103(a) as being unpatentable over **Khazanov et al.** ("Electrolysis of Fused Aluminum Sulfide", *Legkie Metally* (1935), Vol. 4, No. 11, pp. 1-14) as applied to claims 1-5, 7-9 and 14 above, and further in view of **Rogers, Jr.** (US Patent No. 4,133,727).

The rejection of claim 10 under 35 U.S.C. 103(a) as being unpatentable over Khazanov et al. as applied to claims 1-5, 7-9 and 14 above, and further in view of Rogers, Jr. has been withdrawn in view of Applicants' amendment.

III. Claims **11 and 12** have been rejected under 35 U.S.C. 103(a) as being unpatentable over **Khazanov et al.** ("Electrolysis of Fused Aluminum Sulfide", *Legkie Metally* (1935), Vol. 4, No. 11, pp. 1-14) as applied to claims 1-5, 7-9 and 14 above.

The rejection of claims 11 and 12 under 35 U.S.C. 103(a) as being unpatentable over Khazanov et al. as applied to claims 1-5, 7-9 and 14 above has been withdrawn in view of Applicants' amendment.

IV. Claim **13** has been rejected under 35 U.S.C. 103(a) as being unpatentable over **Khazanov et al.** ("Electrolysis of Fused Aluminum Sulfide", *Legkie Metally* (1935), Vol. 4, No. 11, pp. 1-14) as applied to claims 1-5, 7-9 and 14 above, and further in view of **Minh et al.** (US Patent No. 4,464,234).

The rejection of claim 13 under 35 U.S.C. 103(a) as being unpatentable over Khazanov et al. as applied to claims 1-5, 7-9 and 14 above, and further in view of Minh

et al. has been withdrawn in view of Applicants' amendment.

Response to Amendment

Claim Objections

Claim 1 is objected to because of the following informalities:

Claim 1

line 1, the word "aluminium" should be amended to the word -- aluminum --.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

Claims 15-17 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Claim 15

lines 1-2, recite "wherein the concentration of the Al_2S_3 is in the range 4 to 10 wt%".

Applicants' specification discloses that "therefore, the amount of Al_2S_3 added to the quaternary mixture was increased from 4% to 10% (Exp. C and D in Figure 3) [page

12, lines 14-15].

The 4% and 10% shown in Exp. C and D in Figure 3 are singles values. The single values do not make a range.

Claim Rejections - 35 USC § 103

I. Claims **1-5, 7-9 and 11-17** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Minh et al.** (US Patent No. 4,464,234) in view of **Khazanov et al.** ("Electrolysis of Fused Aluminum Sulfide", *Legkie Metally* (1935), Vol. 4, No. 11, pp. 1-14).

Minh teaches a process for the production of primary aluminum, comprising:
electrolyzing (= conducting electrolysis of the bath) [col. 3, lines 55-60] of Al_2S_3 in a bath of molten chloride salt in which the Al_2S_3 is dissolved (= the molten bath is prepared from aluminum sulfide, the alkali metal chloride or chlorides, and the chloride component composed of one or more alkaline earth metal chlorides, ammonium chloride, or mixtures of these chlorides) [col. 3, lines 44-49], wherein the molten chloride salt comprises a MgCl_2 - NaCl - KCl mixture (cols. 4-6, Examples I-III).

The bath of molten chloride salt mainly comprises alkali metal chlorides (= about 20-60 mol% of the alkali metal chloride or chlorides and about 20-70 mol% of the alkaline earth metal chloride or chlorides) [col. 3, lines 27-43].

The bath of molten chloride salt metal is substantially free of earth alkaline chlorides (= a chloride component selected from the group consisting of one or more

alkaline earth metal chlorides, ammonium chloride, or mixtures of these components) [col. 3, lines 8-12].

The electrolysis is carried out at a bath temperature of between 600°C and 850 °C (= 700-800° C) [col. 3, lines 55-57].

The bath of molten chloride salt mainly comprises KCl and NaCl (= about 20-60 mol% of the alkali metal chloride or chlorides and about 20-70 mol% of the alkaline earth metal chloride or chlorides) [col. 3, lines 27-43].

The electrolysis is carried out at a bath temperature of between 700°C and 800°C (= 700°-800° C) [col. 3, lines 55-57].

The concentration of the Al_2S_3 is in the range 4 to 10 wt% (= about 2-10 mol% of aluminum sulfide) [col. 3, lines 32-34].

The process of Minh differs from the instant invention because Minh does not disclose the following:

- a. Wherein an additive comprising a fluoride compound is added to the bath to improve the electrical conductivity of the bath to enable an increase in the current density in the bath, as recited in claim 1.
- b. Wherein the additive consists essentially of the fluoride compound, as recited in claim 2.
- c. Wherein the additive mainly consists of the fluoride compound, as recited claim 3.

d. Wherein the fluoride compound is cryolite, as recited in claim 4.

Minh teaches the electrolysis of Al_2S_3 in a molten bath of NaCl-KCl-MgCl_2 (cols. 4-6, Examples I-III).

Like Minh, **Khazanov** teaches the electrolysis of Al_2S_3 in a molten bath of $\text{NaCl-KCl-3NaF}\cdot\text{AlF}_3$ (page 13, Table17). Khazanov teaches that increases in the concentration of cryolite ($3\text{NaF}\cdot\text{AlF}_3$) increases the current yield (page 5, lines 15-31; Table 6, and Figs. 1-2).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the bath described by Minh with (a) to (d) above because adding cryolite to the bath would have increased the current yield in the electrolysis of Al_2S_3 in the molten chloride bath as taught by Khazanov (page 13, Table17; page 5, lines 15-31; Table 6, and Figs. 1-2).

e. Wherein the concentration of the cryolite is in the range of 5 to 30 wt%, as recited in claim 5.

f. Wherein the concentration of the cryolite is in the range 7 to 15 wt%, as recited in claim 11.

g. Wherein the concentration of the cryolite is about 10 wt%, as recited in claim 12.

h. Wherein the concentration of the cryolite is in the range 7 to 15 wt%, as recited in claim 16.

i. Wherein the concentration of the cryolite is about 10 wt%, as recited in claim 17.

Khazanov teaches that increases in the concentration of cryolite ($3\text{NaF}\cdot\text{AlF}_3$) increases the current yield (page 5, lines 15-31; Table 6, and Figs. 1-2).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the concentration of the cryolite described by the Minh combination because the concentration of the cryolite is a result-effective variable and one having ordinary skill in the art has the skill to calculate the concentration of the cryolite that would have determined the success of the desired reaction to occur, e.g., increases in the current yield (MPEP § 2141.03 and § 2144.05).

II. Claim **6** is rejected under 35 U.S.C. 103(a) as being unpatentable over **Minh et al.** (US Patent No. 4,464,234) in view of **Khazanov et al.** ("Electrolysis of Fused Aluminum Sulfide", *Legkie Metally* (1935), Vol. 4, No. 11, pp. 1-14) as applied to claims 1-5, 7-9 and 11-17 above, and further in view of **Greenfield** (US Patent No. 2,939,824).

Minh and Khazanov are as applied above and incorporated herein.

The process of Minh differs from the instant invention because Minh does not disclose wherein an effective area of an anode extending into the bath is enhanced by reducing an amount and/or size of gas bubbles covering the anode, as recited in claim 6.

Minh teaches a graphite anode (col. 6, Tables I and II).

Art Unit: 1795

Greenfield teaches that:

During the normal operation of fused bath electrolytic cells, the electrolytic action causes the conductive surface of the anode to be surrounded by gas bubbles which smoothly evolve and are removed from the reaction. The phenomenon known as anode effect results in a considerably higher net voltage drop between the electrodes of the electrolytic cell and consequent reduction in cell efficiency, and has been observed in electrolytic cells having fused salt electrolytes containing halides of lead, cadmium, silver, the alkali and alkaline earth metals, magnesium, cerium and aluminum; with complex electrolytes of aluminum fluorides and with commercial fused salt electrolytes. It is theorized that anode effect is caused by the building up of a relatively high resistance ionized gas film or layer on the anode of the cell and that once such a layer has become established, the anode effect tends to perpetuate itself since continued current flow is by arcing through such layer (col. 1, lines 30-47).

It has been found that application of a high voltage across the gas phase established at the anode interface will dissipate this gas phase instantly (col. 3, lines 68-75).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the anode described by Minh with wherein the effective area of an anode extending into the bath is enhanced by reducing the amount and/or size of gas bubbles covering the anode because reducing the amount and/or size of gas bubbles covering the anode would have eliminated the high net voltage drop between the electrodes of the electrolytic cell and consequent reduction in cell efficiency as taught by Greenfield (col. 1, lines 30-47; and col. 3, lines 68-75).

The reason or motivation to modify the reference may often suggest what the inventor has done, but for a different purpose or to solve a different problem. It is not necessary that the prior art suggest the combination to achieve the same advantage or result discovered by the Applicants. *In re Linter* 458 F.2d 1013, 173 USPQ 560 (CCPA 1972); *In re Dillon* 919 F.2d 688, 16 USPQ2d 1897 (Fed. Cir. 1990), *cert. denied*, 500

US 904 (1991); and MPEP § 2144.

III. Claim **10** is rejected under 35 U.S.C. 103(a) as being unpatentable over **Minh et al.** (US Patent No. 4,464,234) in view of **Khazanov et al.** ("Electrolysis of Fused Aluminum Sulfide", *Legkie Metally* (1935), Vol. 4, No. 11, pp. 1-14) as applied to claims 1-5, 7-9 and 11-17 above, and further in view of **Rogers, Jr.** (US Patent No. 4,133,727).

Minh and Khazanov are as applied above and incorporated herein.

The process of Minh differs from the instant invention because Minh does not disclose wherein the electrolysis is carried out in a multi-polar electrolysis cell, as recited in claim 10.

Rogers teaches that carrying out molten salt electrolysis in a multi-polar electrolysis cell (col. 3, lines 20-31; and Fig. 1).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the electrolysis described by Minh with wherein the electrolysis is carried out in a multi-polar electrolysis cell because using a multi-polar electrolysis cell would have extracted heat from the electrolysis chamber containing a molten salt bath as taught by Rogers (col. 3, lines 20-31; and Fig. 1).

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37

CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to EDNA WONG whose telephone number is (571) 272-1349. The examiner can normally be reached on Mon-Fri 7:30 am to 4:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on (571) 272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should

Art Unit: 1795

you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Edna Wong/
Primary Examiner
Art Unit 1795

EW
April 24, 2009